

**NONAQUEOUS ELECTROLYTE BATTERY AND CHARGE/DISCHARGE SYSTEM
THEREOF**

Examiner: Adam Arciero S.N. 10/552,920 Art Unit: 1727 October 21, 2011

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 15, 2011 has been entered. Claims 4-5 and 9 have been canceled. Claims 14-17 are newly added. Claims 1, 6-8 and 14-17 are currently pending and have been fully considered.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

3. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. and Goto et al. on claims 1, 6 and 8 are withdrawn.

4. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over Inoue et al., Goto et al. and Shoichiro et al. on claims 11 and 13 are withdrawn because Applicant has deleted the claims.

5. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over Inoue et al., Goto et al. and Fernandez et al. on claim 7 is withdrawn.

6. Claims 1, 6-8 and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. (US 5,707,756) in view of Goto et al. (US 2002/0094481 A1) and in view of Takeuchi et al. (EP 1 324 418 A1; as found in IDS dated 08/17/2009).

As to Claims 1, 6-8, Inoue et al. teaches a lithium-ion battery comprising a positive electrode having an active material layer, a negative electrode comprising a negative active material layer, a separator and a lithium-ion conductive non-aqueous electrolyte (col. 6, lines 30-61). Said positive active material comprises a lithium transition metal composite oxide (col. 11, lines 10-50) and said negative material comprises graphite (claim 8) (col. 15, lines 24-45) which is capable of intercalating and deintercalating lithium ions (col. 6, lines 30-61). The final charge voltage of said non-aqueous battery is set to 4.3 V (col. 44, Example 2). Inoue et al. teaches a positive active material comprising a lithium transition metal composite oxide represented by the formula: $\text{Li}_x\text{Co}_a\text{Ni}_{1-a}\text{O}_2$ wherein $x=0.2$ to 1.2 and $a=0.1$ to 0.9 . The prior art ranges taught by Inoue et al. overlap the claimed ranges. The courts have held that in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990) (claims 10 and 12). Inoue et al. does not specifically disclose wherein the lithium composite oxide further comprises at least two of the elements selected from the group of claim 1. Inoue et al. does not expressly disclose the capacity ratio of the positive active material to negative active material as being 1.5 to 2.2. However, Inoue et al.

teaches the ratio for the contents of the positive active material and negative material, depending on the varieties of the compounds and formulations of the compositions, can be optimized so as to improve the capacity, cycle life and safety of the battery (col. 33, lines 36-59). Inoue et al. is teaching that said ratio is a results effective variable. The courts have held that optimization of a results effective variable is not novel. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

However, Goto et al. teaches of a lithium secondary battery comprising a positive active material comprising the compound represented by the general formula of $\text{LiCo}_{1-y}\text{M}_y\text{O}_2$; where $0 \leq y < 1$ and wherein M can be Al and Ni (paragraph [0039]). The prior art ranges taught by Goto et al. overlap the claimed ranges. The courts have held that in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990) (claims 10 and 12). Furthermore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the battery of Inoue et al. with the positive active material of Goto et al., because Goto et al. teaches that the battery will exhibit a high discharge capacity upkeep ratio (paragraph [0114]).

In addition to Inoue et al.’s teaching of the ratio of Wp/Wn as being a result-effective variable, Takeuchi et al. teaches of a lithium-ion secondary battery comprising a ratio of positive active material to negative active material (Wp/Wn) of 1.35-2.25 (Abstract). Takeuchi et al. further teaches wherein the end of charge voltage to at least 4.40V (Abstract). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the battery of Inoue et al. and Goto et al. with a ratio of positive active material to negative active material (Wp/Wn) of 1.35-2.25, because Takeuchi et al. teaches that the energy density of the secondary

cell can be greatly increased (Abstract). Furthermore, these ranges overlap or lie inside the claimed ranges of the present application. The courts have held that in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990).

As to Claims 14-17, Inoue et al. and Goto et al. teach the secondary battery of claim 1. However, the combination does not specifically disclose wherein the end of charge voltage is set to higher than 4.30V and less than 4.50V

However, Takeuchi et al. teaches of a lithium-ion secondary battery comprising a ratio of positive active material to negative active material (Wp/Wn) of 1.35-2.25 (Abstract). Takeuchi et al. further teaches wherein the end of charge voltage to at least 4.40V (Abstract). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the battery of Inoue et al. and Goto et al. with an end of charge voltage of at least 4.40V, because Takeuchi et al. teaches that the energy density of the secondary cell can be greatly increased (Abstract). Furthermore, these ranges overlap or lie inside the claimed ranges of the present application. The courts have held that in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990).

Response to Arguments

7. Applicant's arguments with respect to claims 14-17 have been considered but are moot in view of the new ground(s) of rejection as necessitated by Applicant's amendments to the claims.

8. Applicant's arguments with respect to independent claims 1 and 6 have been considered but are not persuasive.

Applicant's principle arguments are:

- a) *Table 3 in Applicant's present disclosure displays unexpected results for the ratio of Wp/Wn which were not discussed nor suggested in the prior art (claims 1 and 6).*

In response to Applicant's arguments, please consider the following comments:

a) Applicant's results in Table 3 are not found to be unexpected. Inoue et al. teaches of the importance of optimizing the ratio of the contents of the positive active material to the negative active material to achieve the same results as the present disclosure. Inoue et al. teaches that capacity, cycle life and safety of the battery can all be improved (col. 33, lines 36-59). Thermorunaway temperatures are safety concerns of the battery, therefore the results are not seen to be unexpected because Inoue et al. is directed to solving the same problems as the present disclosure. Furthermore, the results in Table 3 are not completely commensurate with the scope of the claims. The results in Table 3 appear to be greatly affected by the positive active material to a greater degree than the claimed ratio. The only elements found in the positive active material in Table 3 are Li, Co, Mg and Al, whereas the claims recite the possibility of Sr, Mn, Ni and Ca. Furthermore, battery 5 at an end of charge voltage of 4.25 V compared to battery 3 at an

end of charge voltage of 4.25 V only exhibits an increase of 5 °C which is not a significant result. Therefore, the results shown in table 3 are not consistently significant.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ADAM A. ARCIERO whose telephone number is (571)270-5116. The examiner can normally be reached on Monday to Friday 7am to 4pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara Gilliam can be reached on 571-272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ADAM A ARCIERO/
Examiner, Art Unit 1727

/Barbara L. Gilliam/

Application/Control Number: 10/552,920
Art Unit: 1727

Page 8

Supervisory Patent Examiner, Art Unit 1727